

HR-304 Production of Acetic Acid for CMA Deicer

Key Words: Calcium Magnesium Acetate, Deicer salts, Corn Steep Liquor

1. Low cost substrates are available in high quantity in Iowa. The most important are clarifier starch, pericarp starch, and corn steep liquor, and should cost approximately one-half that of "pearl starch" or corn.
2. Several microbial alternatives to *Clostridium thermoaceticum* exist, especially several that can use both glucose and lactate. Three organisms in particular should be examined experimentally: ***Acetobacterium woodii*, *Acetobacterium carbinolicum* and *Acetogenium kivui***. Both mono- and mixed cultures should be examined.
3. These organisms need to be thoroughly studied with lactate, glucose, corn steep liquor and hydrolyzed starches as substrates. Lactate, glucose and protein/amino acid consumption should be followed concurrently with acetic acid production.
4. Experimental data collected with *A. woodii* demonstrate:
 - Corn steep liquor (CSL) is originally inhibitory to *A. woodii*.
 - Cultures can be developed that are resistant to this inhibition.
 - CSL can apparently serve alone as a substrate for acetic acid production.
4. Further careful, full time, experimentation will be needed to fully describe the potential of this organisms and similar others to produce acetic acid from CSL
5. Corn steep liquor itself needs to be examined from two different perspectives:
 1. Can CSL be centrifuged to remove the particulate material (e.g. bacterial cells and insoluble ppt), leaving a liquid that is richer in lactic acid, and lower in protein? This would be preferred, perhaps, since CSL has an excessively high N content for acetic acid production. Also, some components that are inhibitory may also be removed. The resulting "sludge" could be added to animal feed, as is currently done with entire CSL. The liquid stream could then be converted to acetic acid.
 2. Can CSL be used directly or indirectly as a chemical feedstock for a "road salt" substitute? For example, CaMg lactate could be produced, due to the high lactate content (26% of dry weight) of CSL. If this was less corrosive than NaCl, it would certainly be cheaper than CaMg acetate. To evaluate this possibility, some process engineering and corrosion experiments are needed. In addition to these studies, some evaluation of the environ-mental impact should be made e.g., since CSL is fairly high in N, run off of N to the roadside should occur. Besides making the grass grow better, what would result? Due to the low S₀₄ content, we would not predict that sulfide odors would be a problem due to microbial sulfate reduction

A multidisciplinary approach using expert system technology can be of value in decisions regarding the economic viability of CMA production, when more experimental data become available.